

WHAT IS CLAIMED IS:

1. A polymer membrane comprising a first polymer comprising acidic subunits and a second polymer comprising basic subunits, wherein (i) at least one of said first or second polymers is an elastomeric copolymer further comprising elastomeric subunit, or (ii) the
5 polymer membrane further comprising an elastomeric polymer comprising elastomeric subunits.
2. The polymer membrane of claim 1 wherein said first polymer comprises sulfonic acid, phosphoric acid or carboxylic acid groups.
3. The polymer membrane of claim 2 wherein said first polymer comprises
10 sulfonated polyetherether ketone sulfonated polyetherether sulfone.
4. The polymer membrane of claim 1 wherein said second polymer comprises an aromatic amine, an aliphatic amine or a heterocyclic nitrogen.
5. The polymer membrane of claim 4 wherein said second polymer comprises polybenzimidazole or polyvinylimidazole.
- 15 6. The polymer membrane of claim 1 wherein said elastomeric polymer comprises a semi-interpenetrating network in said membrane.
7. The polymer membrane of claim 1 wherein said elastomeric polymer comprises polyacrylonitrile.
8. The polymer membrane of claim 1 wherein said elastomeric copolymer comprises
20 an elastomeric subunit comprising acrylonitrile.

9. The polymer membrane of claim 1 wherein said first polymer comprises sulfonated polyetherether ketone, and said elastomeric copolymer comprises basic subunits comprising vinylimidazole and elastomeric subunits comprising acrylonitrile.
10. The polymer membrane of claim 1 wherein said second polymer comprises polyvinylimidazole and said elastomeric polymer comprises acidic subunits comprising 2-acrylonamide-2-methyl-1 propane sulfonic acid and elastomeric subunits comprising acrylonitrile.
11. The polymer membrane of claim 1 wherein said membrane is permeable to protons.
12. The polymer membrane of claim 1 wherein said membrane is substantially impermeable to methanol.
13. A membrane electrode assembly comprising the polymer membrane of claim 1 and first and second catalysts positioned respectively on first and second opposite surfaces of said membrane.
14. A membrane electrode assembly of claim 13 further comprising a cathode electrode and an anode electrode, wherein each of said electrodes is separately in electrical communication with said first and said second catalysts.
15. An electrochemical device comprising the polymer membrane of claim 1.
16. The electrochemical device of claim 15 comprising a battery.
17. A fuel cell comprising the polymer electrolyte membrane of claim 1.
18. A fuel cell comprising the membrane electrode assembly of claim 13 or 14.

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